Physics to Finance

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Who, What and Where

- Who needs PhDs:
  - hedge funds, "quant shops"
  - investment banks
  - proprietary trading firms, "prop shops"
  - research firms
- Quantitative finance positions:
  - quant researcher, developer, back-office/risk quant, desk quant
  - trader, fund manager
- New York, Chicago, London, Hong Kong

Why experimental particle physicists?

- Analytical, inquisitive, problem solver, work independently, etc., etc.,...
- Skill set match - **Bingo!**
  - math
  - programming
  - handling large data sets
  - modeling
- Other fields of science and math require these skills - not just particle physicists hired

What's it like?

- Culture varies greatly - specific to firm/group
- Hours: typically market hours, "9-5"
- Support structure: team of developers, sys admins, help desk personnel
- Significant thought on research direction
- Timelines much shorter than HEP
- Most projects are proprietary, the firm's IP
- Connection to Academia, finance journals
- A typical day in the life of a quant

What does it take to transition?

- Knowledge of industry helps
  - Be familiar with historic and current events
    - 1987 Stock Market crash
    - LTCM collapse in 1998
    - May 2010 Flash Crash
  - Understand derivatives (options, futures)
  - You are not expected to be a finance expert but must show interest
- Read, read, read
- Network, network, network
- Contact a quant recruiter
- Know thyself - where you might fit in?

Skills required

- Coding: C/C++,C#, Java, Python, VB
  - strength in C/C++ is necessary
  - will likely have to learn another on-the-job
- Stats/modeling language/software packages
  - Numpy/SciPy (python)
  - R
  - SAS, *Statistical Analysis System*
  - Matlab
- Database query language, eg., SQL
- Math: probability, statistics, time series analysis, signal response analysis, PCA

Skills continued...

- More math and modeling: stochastic calculus, Monte Carlo, linear regression
- Understand pricing and risk models and their limitations
  - Black-Scholes option model
  - Value at Risk (VaR)
- Soft skills:
  - ability to communicate complex ideas !!!
  - work independently

Preparing for an interview

- Refresh your maths - you will be tested
- Clear and concise description of your HEP research - you will be asked
- Developer
  - know the standard libraries and structures in C++
  - know your algorithms: sorting, random, shortest path
- Did you use Root in HEP? Fit, MINUIT?
  - look under the hood
  - what kind of regression and why?
- You may be given a homework project

Achieving success

- Communicate complex ideas well
- Know the limitations of maths, models, algos
- Balance thoroughness with timeliness
- Don't overfit the data!
- Bring new ideas, new sources of *alpha*
  - quantify human behaviors
  - Twitter feeds ?
  - AP, Thomson-Reuters news feeds
- Build market intuitions
- Start your own group within firm

Resources

- Books
  - *The Quants*, Scott Patterson (WSJ)
  - *My Life as a Quant: Reflections on Physics and Finance*, Emanuel Derman
  - *Options, Futures and Other Derivatives*, John C. Hull
- Websites
  - quantfinancejobs.com
  - topcoder.com: algorithm tutorials
  - wilmott, quantnet: Quantitative finance community
  - "Learning from Data", Yaser Abu-Mostafa, Caltech Machine Learning class lectures, on youtube
  - ftalphaville.ft.com, finance news, blog, commentary